I. THE SLOWING DOWN OF NEUTRONS
II. A REPRODUCIBLE STANDARD OF NEUTRON INTENSITY

BY
GEORGE ROYCE GAMERTSFELDER
B.A., North Central College, 1937
M.S., University of Illinois, 1939

AN ABSTRACT OF A THESIS
SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN
PHYSICS IN THE GRADUATE SCHOOL OF THE
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URBANA, ILLINOIS
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I. THE SLOWING DOWN OF NEUTRONS

The slowing down in water of neutrons of various energies has been investigated using a method similar to that of Frisch, v.Halban and Koch.[1] The sources used were the following: Rd Th + D_2O (220 kev), Rd Th + Be (880 kev), Y + Be (220 kev), Sb + Be (115 kev), Ra + D_2O, Ra + Be, Ra - α - Be. The numbers of neutrons contained in spherical shells surrounding the source have been plotted as a function of the radius of the shells giving curves whose shapes vary with the primary neutron energy. These curves can be used for estimating the neutron energy of new neutron sources. By using a Cd screen to absorb C neutrons it has been shown for sources of comparatively low energy neutrons (a few hundred kev) that at large distances from the source the fast neutrons have practically disappeared leaving mainly C neutrons. For neutrons of higher initial energy ($\geqq$ 1 mev) this is not the case.

The neutron intensity of each source used has been determined.

It has been shown by observing the neutrons produced in D_2O that the radioactive yttrium isotope of 100 day half life emits a high energy gamma ray due to a forbidden transition previously not detected. The intensity of this gamma ray was found to be less than 1% of the intensity of the known 1.9 mev. and .9 mev gamma rays of the same isotope, and its energy is probably the sum of these two.

II. A REPRODUCIBLE STANDARD OF NEUTRON INTENSITY

A neutron intensity standard has been devised which may easily be reproduced. Its intensity has been measured relative to a laboratory standard whose neutron yield was determined absolutely by O'Neal and Scharff-Goldhaber. The reproducible

1. O. R. Frisch, H. v.Halban and J. Koch, Proc. Danish Acad. **15**, 10 (1938).

standard consists of a cylindrical Be block 1.5 inches high and 1.5 inches in diameter exposed to a Ra source placed 4 cm above its face. It was found to emit 62 $\pm$ 7 neutrons per second per millicurie Ra.

VITA

George Royce Gamertsfelder was born in Naperville, Illinois in 1916. He attended the public schools of Decorah, Iowa and Naperville, Illinois. In 1937 he was graduated with a Bachelor of Arts degree from North Central College. Since 1937 he has been a part-time teaching assistant at the University of Illinois. He received the Master of Science degree from the University of Illinois in 1939. He is a member of the American Physical Society and of Sigma Xi.

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